

WEST VIRGINIA UNIVERSITY
COLLEGE OF ENGINEERING AND MINERAL RESOURCES
LANE DEPARTMENT OF COMPUTER SCIENCE AND ELECTRICAL ENGINEERING

EE 513: Stochastic Systems Theory
Ph.D. Qualifier Topics

Texts: A Leon Garcia, *Probability, Statistics, and Random Processes for Electrical Engineering*, Addison Wesley, 3rd edition, 2008. *This book (and its earlier editions) has been the required text for EE 513 since 2001.*

A. Papoulis and S. U. Pillai, *Probability, Random Variables and Stochastic Processes*, McGraw Hill, 4th edition, 2002. *This is another commonly textbook used at many other universities.*

H. Hsu, *Schaum's Outline of Probability, Random Variables, and Random Processes*, McGraw Hill 2nd edition, 2010. *This is a supplemental book containing many solved problems. Do not use it as your primary reference.*

Topics: The focus of the qualifying exam is on chapters 2-10 of Leon Garcia, including the following specific concepts (with sections from Leon Garcia indicated):

1. Probability, conditional probability, independence, combinatorics 2.1-2.6
2. Discrete random variables and pmf 3.1-3.2
3. Continuous random variables, CDF, and pdf 4.1-4.2
4. Expectation 3.3 and 4.3
5. Conditional pmf, CDF, and pdf 3.4 and 4.2.2
6. Functions of random variables 4.5
7. Markov and Chebyshev inequalities 4.6
8. Transformation methods and characteristic functions 4.7
9. Pairs of random variables, joint CDF and joint pdf 5.1-5.5
10. Joint moments, correlation, covariance, conditional expectation 5.6-5.7
11. Functions of 2 random variables 5.8
12. Random vectors 6.1-6.5
13. Linear transformations of random vectors 6.3.2 and 6.6
14. Sums of random variables and the central limit theorem 7.1-7.3
15. Random processes, autocorrelation, and autocovariance 9.1-9.4
16. Stationarity 9.6
17. Power spectral density and response of LTI system 10.1-10.2
18. Gaussian variables, vectors, and random processes 4.4.3, 5.9, 6.4, 9.5